95 Hiding in the Background

In the last activity, you considered the interaction between the environment and a species over a long span of time. You saw that the location of leaves on trees could affect which giraffes survived. Over many generations, longer-necked giraffes would be more likely to reach the uppermost leaves on tall trees. This might make them more likely to survive, reproduce, and pass their traits on to their offspring. If this were to happen, longer necks would be called an adaptation to the tall-tree environment.

Adaptations that make a species more successful are not always traits that make the species stronger, bigger, or faster. For example, some adaptations decrease the chances that a species will be eaten by another species. Adaptations of this type include the skin colors of lizards, the spines of porcupines, and the scent glands of skunks.

CHALLENGE

How do factors such as the environment and the presence of predators affect the process of natural selection?

MATERIALS

For each group of four students

- **2 paper bags**
- **100 green toothpicks**
- **100 beige toothpicks**

For each student

- **1 Student Sheet 95.1, "Worm Populations"**
- **1 clear plastic bag**

The Toothpick Worm Model

Imagine that you are a bird that eats small worms. In this activity, toothpicks of two different colors will represent the worms that you eat.

PROCEDURE

1. Label one of the paper bags "Worms" and the other "Reserve Toothpicks."
2. Each toothpick represents a worm. Count 25 green "worms" and 25 beige "worms" and place them into the paper bag labeled "Worms." This is the initial number of worms. These amounts are already marked for you in both tables on Student Sheet 95.1, "Worm Populations" (Table 1 is for green worms and Table 2 is for beige worms).
3. Place the rest of the toothpicks into the bag labeled "Reserve Toothpicks."
4. Shake the "Worms" bag to mix the worms.
5. As directed by your teacher, scatter the worms on the "ground."
6. You are going to play the role of a bird that eats worms. Your group must "eat" (pick up) 40 worms, and so decide how many worms each member of your group will "eat." You must pick up the first worms that you see, regardless of the color, and place them in the clear plastic bag, which represents the bird's stomach.
7. Count the total numbers of green and beige worms eaten by your group. Record these totals in Row 2 of each table on Student Sheet 95.1. Be sure to stay in the column for this generation.
8. *Some worms are still alive.* Subtract the number of worms that your group "ate" from the initial population in that generation. For example, if your group collected 18 green worms, there must be 7 green worms still alive on the ground (25 – 18 = 7). Record the numbers of surviving green and beige worms in Row 3 of each table on Student Sheet 95.1.
9. *Each living worm is reproducing.* On Student Sheet 95.1, multiply the numbers of green and beige worms still alive by 4. For example, if you had 7 green worms still alive, there would be a total of 28 green offspring worms (7 x 4 = 28). Record this number in Row 4.

10. Add one toothpick for each new green and beige worm into your paper bag labeled "Worms." For example, if your group had 7 green worms surviving on the ground, you would add 28 green toothpicks to the paper bag.

11. On Student Sheet 95.1, add Rows 3 and 4 of each table to calculate the final populations of green and beige worms. Record these numbers in Row 5 of each table. Record these same numbers in Row 1 in the columns for the *next* generation.

12. Repeat Steps 4–11 for Generations 2 and 3. If you have time, perform the simulation for further generations.

ANALYSIS

1. **a.** Determine the ratio of green to beige worms in each generation. For example, the ratio of green to beige worms in Generation 1 is 25:25, or 1:1.

   b. Describe how the ratio of green to beige worms changed over the three generations.

   c. Why do you think this change occurred? Explain.

2. Imagine that you performed this simulation for another generation. What do you predict the ratio of green to beige worms would be? Explain your prediction.

3. Due to a drought, grass begins to dry out and die, leaving only dead grass stalks. What is likely to happen to the ratio of green to beige worms? Explain.

4. **a.** In this activity, what effect did the environment have on the process of natural selection?

   b. In this activity, what role did the predator (bird) have in the process of natural selection?

5. What are the strengths and weaknesses of this activity as a model for natural selection?

6. **Reflection:** Why do you think earthworms are beige and not green?

EXTENSION

Repeat the activity wearing a pair of sunglasses with green lenses. How are your results different?